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ABSTRACT

The uses of computers by colleges and universities are described, and some definitions of computer literacy are proposed. In addition, an essay, "Computing and Higher Education: The Revolution Is Through the Gates," by Robert G. Gillespie briefly considers the efforts colleges are making to explore the potential of the personal computer. The following developments at colleges are described: Rollins College's plan to make computer literacy a graduation requirement by 1985; Carnegie-Mellon University's plan to introduce a distributed computing network to provide access to powerful personal computers; Pepperdine University's efforts to ensure computer literacy of the faculty, along with the development of introductory courses and computer-based instruction; Marymount Manhattan College's incorporation of a computer literacy program in the liberal arts curriculum; Hamline University's establishment of a computer literacy requirement for all students, which may be met by proficiency testing, computer science courses, or a self-paced computer-assisted short course; and Drexel University's requirement by 1983 that all freshmen buy their own microcomputers. Additional program descriptions and information on resources are included, along with information on the donation of equipment by computer vendors to colleges. (SW)

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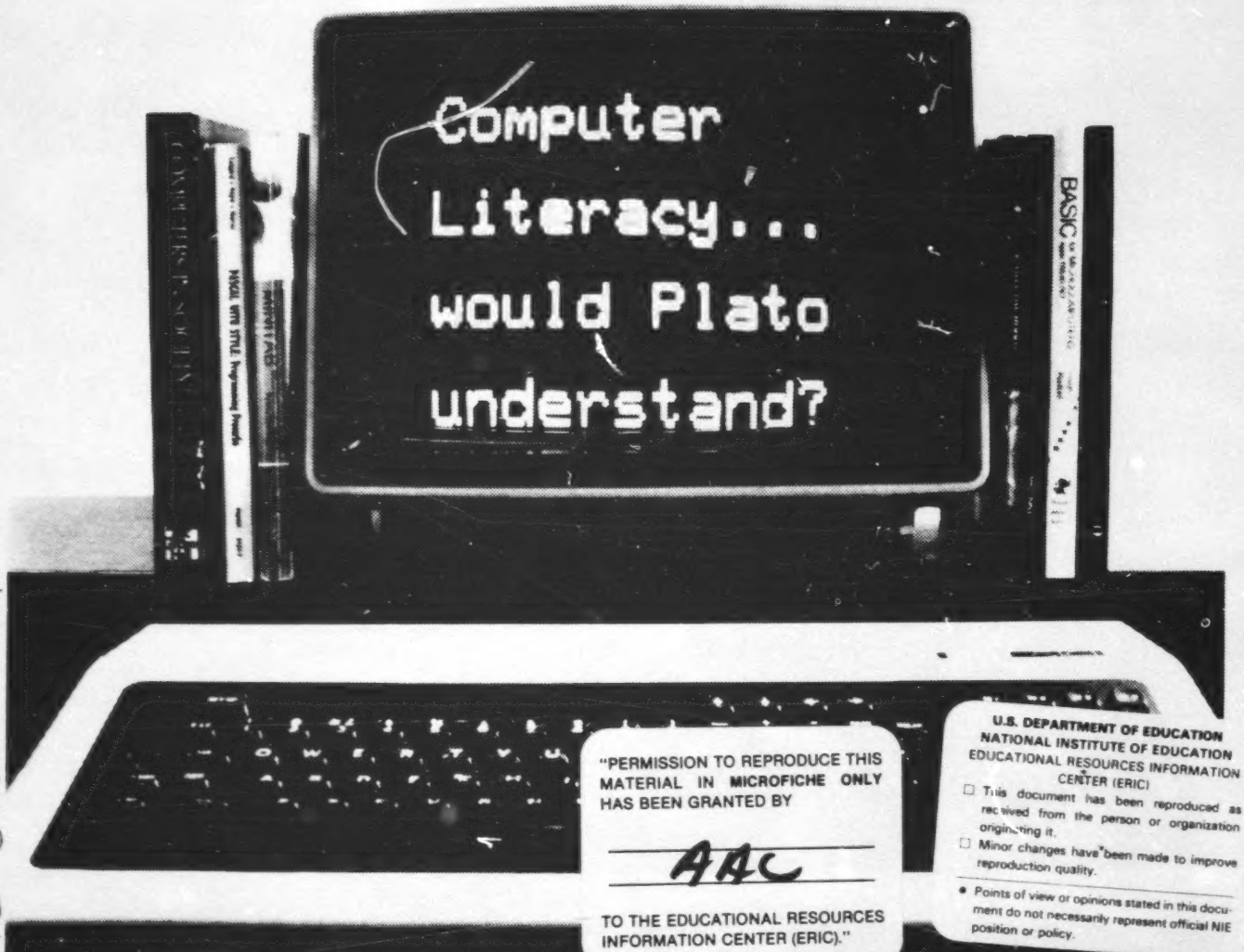

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Computer Literacy

Two years ago *Forum* reported on the creative and innovative uses of computer-based learning in such diverse areas as Arabic, music theory, and religious studies. Although several articles described the wide range of activities coordinated by campus computer centers, few described efforts to promote computer literacy. Much has happened in two short years. Drexel University will require all freshmen to purchase microcomputers in fall 1983, Carnegie-Mellon University is creating a personal computer network with the assistance of on-campus IBM researchers, and the term "computer literacy" is cropping up in college catalogs across the country.

Computer literacy means different things on different campuses. Many administrators describe it as the ability to use the computer in ways appropriate to one's discipline, others stress only the necessity of being able to communicate with computer professionals. Articles in this issue offer several definitions for computer literacy and describe how various campuses are reacting to what essayist Robert Gillespie terms "an accidental revolution" in computing.

Computing and Higher Education: The Revolution is Through the Gates

by Robert G. Gillespie
Vice Provost for Computing, University of Washington

Dogs and computers can smell fear.
–Computing folklore

When I started using computers in 1955 my first experience with the early behemoths matched the quote above. Since the systems relied on electrostatic storage–t.v. tubes–they were susceptible to the stray static electricity and the mean time between failures was on the order of 15 minutes; one was reduced to incantations and prayers when running longer programs. The computer I now carry with me to access networks and draft material weighs four pounds, is expected to have a failure rate of less than once a year, and is faster and has more memory than my 1955 model which occupied 1000 square feet of space.

Friction is a force that keeps you from achieving goals easily; in computing, the friction has decreased by several orders of magnitude. Not only can I carry the access to computing power around with me, but I no longer have to program tediously in machine language. The change in the capabilities of the tool have changed how I use it.

In those early days we speculated occasionally about the influence the newly invented transistor would have on the capabilities of computers, but rarely were people willing to discuss uses other than the ones for which only computers could be used–complex scientific problems and very large data processing applications, such as those used for the census and the insurance industry. Ideas about the influence of these tools on organization structure were seen as radical. Educational uses were seen as primarily research into computing or teaching how to use computers in scientific research.

The enthusiasm for new tools often sweeps faster than the lagging support for them. Personal computers today run the risk in education of out distancing

the infrastructure of support – as has happened with other technologies. The most immediate impact of the personal computers is associated with the improvements in **individual** productivity. Since the goals of higher education include the production and dissemination of knowledge, it isn't surprising that faculty and students are using their own resources to obtain these improved capabilities. However, there are many issues that will arise before we enter that world of free access and communication. Who is going to pay for the computers, the software, the networks, the support, and the services? How can one access the library if it isn't automated? Why would the curricula be redeveloped if there are no facilities for students?

The process of the diffusion of the tools follows a regular sequence:

1. Computers are first used as **replacements** for functions performed manually.

2. Computers become **tools** for new kinds of tasks as new capabilities are found.

3. Computers become **structurally integrated** into the system, forcing re-analysis of goals and overall structure.

However, we have been changing several variables at once and masking the processes. Each decrease in cost and improvement in performance opens up more options. For instance, the introduction of the personal computer (p.c.) does not mean that we are going to eliminate existing computer processes. The major efforts today in a number of private colleges and universities are directed at learning about the potential of the p.c., the support needed, the capabilities necessary in the p.c. itself to support uses, and effective strategies for their introduction. Note that public universities often have constraints that will make it difficult to make such a sweeping commitment to p.c.s. The commitments of some universities to p.c.s represent a first wave of investigation:

Clarkson College of Technology	provided p.c.s to all freshmen in fall 1983
Rensselaer Polytechnic Institute	provided p.c.s to a few students for experiments to determine use, impact, types of equipment
Stevens Institute of Technology	students majoring in science or system planning and management must purchase p.c.s
Oberlin College	a standard portable computer was chosen to provide a basis for wide use
Drexel University	all freshmen will be required to purchase p.c.s
Carnegie-Mellon University	joint research with IBM in the development of work stations; leading to p.c.s for all freshmen by 1986

The rapidly expanding exposure of the United States population to computers is continuing – more than 3 million computers were sold last year with more than 6 million expected to be sold this year. Of course the major uses for the units were games and elementary programming. Still this growth represents a change in values perceived by citizens. People, although not understanding the uses themselves, want their children to have a knowledge of this new tool.

The ill-defined term "computer literacy" has developed to represent a type of understanding which differs from expertise. Different disciplines are evolving different meanings. Computer literacy can be achieved through a course describing computers, their social impact, and the applications. Or it can mean the introduction of programming languages and the structure of computers. Other alternatives range from "computer fluency" to, even, "computer appreciation."

Still, computer literacy in higher education may represent a transition rather than a long term need. If high schools and grade schools are effective in their introduction to computers, then that task will not be needed in colleges. Needs for uses and instruction in computers will be established by disciplines and professions.

My advice to educators and administrators is to get involved with computers; become "computer literate," seek experiments, and avoid unrealistic expectations. While the productivity of the faculty and staff and students will increase, don't expect that fewer resources will be needed. Universal access will mean a scale similar to current library investments. We are entering a period in which the capital investments required to meet the goals of education will be increasing. While computer hardware is becoming less expensive, the uses and numbers of users are expanding, and the cost of support (labor) is increasing. If every student and faculty member needs five to ten hours access, the costs will be easy to estimate.

Meet the revolution with confidence by making sure that you are part of it.

Mr. Gillespie conducted a 1981 National Science Foundation study on computing and higher education, which is reported in Computers and Higher Education: An Accidental Revolution.

Rollins College

Seeking 100 Percent Literacy

In 1985 Rollins College will celebrate its centennial anniversary and by that date administrators hope to have computer literacy as a graduation requirement. Administrators, faculty members, and students on the College Planning Committee initiated the goal in 1980 because "to be liberally educated is in part, to understand the forces that shape your culture (and) this clearly involves an understanding of. . . the computer." The committee added that being computer literate will reduce students' anxiety upon entering the work force and improve their qualifications.

Administrators estimate that presently at least 60 percent of the students are computer literate. A computer literate student is "comfortable with the computer as a tool, knows when it is appropriate to use, and understands its capabilities," says James Warden, director of computer

services. To help more students become computer literate, the college applied for and received a grant from the Jessie duPont Religious, Charitable, and Educational Fund. The grant has enabled the computer science department to install the new, more powerful Digital Equipment VAX 11750 computer, add 40 new terminals to make a total of 70, and to expand their computer classroom/laboratory.

The present computer literacy figure is based on the number of students who take the computer literacy course, which has been offered as an elective since 1975. Over the years the course has evolved from a straight programming course to one that is a little broader, says Warden. "We've introduced word processing and show students how to use a statistics package," Warden says. Usually three or four professors, including Warden, offer the course each term. Most of the professors are from the mathematics department, but two physicists, a biologist, and a chemist have also offered the course. "It's loosely collaborative; we share ideas but it's not taught as a team course per se," Warden says. "Each instructor can make up whatever syllabus he or she likes." The professors' different perspectives are an asset to the course, Warden adds.

The course is applications oriented. Warden stays away from mathematical problems and teaches students how to compute a mortgage, write out a recipe, and figure out the dining hall's computerized cashier system. Students have read that computers can do these tasks and this is what draws them to the class, Warden says. The course instructors are not preparing the students for additional computer courses; they are interested in "making the computer a useful tool for the students," Warden says.

Computer anxiety is most apparent in the computer literacy course, Warden says, because only approximately 25 percent of the students have previous computer experience. To reduce the anxiety Warden says, "we work with the students one-on-one. The people who are anxious are in your office a lot asking about programs. We don't have a blanket technique, except to take it slow and use exercises that reinforce the students – simple things that deal with the ideas they're familiar with."

Computer-based learning goes on in courses outside the computer department and Warden believes they account for a higher computer literacy rate than the 60 percent presently estimated. In the humanities, a composition course uses a tutorial package called N-DRIVE from the University of Notre Dame to help students improve their writing skills. An English professor has been analyzing Chaucer on the computer and has encoded the entire Canterbury Tales. The music department is presently looking for software for a microcomputer that will play musical notes, and the political science department is planning on using the computer for demographic studies and word processing.

The chemistry department regularly has students use chemistry tutorial packages from CONDUIT, a publishing house for software in Iowa. Simulation packages are popular with the biology department. For two weeks each year 80 to 100 biology students flood the computer lab and use a SIMFLY package to breed flies on the computer and determine crosses and genetic patterns.

The economics statistics class and the psychology department are the largest users of the computer. The statistics course uses a MINITAB statistical package, which Warden highly recommends. The psychology department does numerous experiments on the computer, including sleep research and studies of arrhythmic behavior in the heartbeat of dogs.

These operations go on for the most part in the new computer laboratory/classroom, completed in January 1983 and funded by the grant. The room will be fully equipped by summer 1983 with four printers and 16 cathode-ray terminals (CRTs). The room has "consolidated the equipment and put it in a visible place, which we've been needing for four or five years," Warden says.

Plans for the Future

To meet their goal of 100 percent literacy, faculty members from all departments will focus on incorporating more computer-based learning in their courses. Faculty members, including Warden, are also interested in offering a new computer literacy course that does not include much programming, and will, therefore, attract more liberal arts students. The roadblock to developing the course is availability of trained faculty, Warden says.

So that more faculty are able to incorporate computer-based instruction in their courses, Warden will offer fall workshops to faculty on various aspects of the computer. In the past he has offered summer workshops that have proved popular. The workshops generally consist of two or three sessions on subjects that faculty have expressed interest in. In fall 1983 Warden will focus on the new computer, statistical packages, and possibly, the use of computers to teach foreign languages. Summer 1982's workshops included Word Processing Fundamentals, Data Processing at Rollins, Pascal Programming, The MINITAB Statistics Package, and The Apple II and You.

To increase computer literacy students should be invited and enticed to use computers and not necessarily required to take a computer course, Warden says. "I would hate to have 1,300 captives that come grumbling, having to learn something about computers. . . the coercion is already there – most students know they are going to have to find out something about the computer sooner or later." Warden hopes Rollins reaches 100 percent computer literacy "by offering the right kinds of courses." *T.A.*

For more information, contact James Warden, Director of Computer Services, Rollins College, Winter Park, FL 32789. 305/646-2403.

Carnegie-Mellon University

A Personal Computing Network

In early 1985 Carnegie-Mellon University administrators will begin introducing a distributed computing network that will eventually provide the entire campus community with access to personal computers 20 to 100 times more powerful than the average home computer. The timetable for the system that CMU President Richard Cyert describes as a "revolution in education," calls for

7,500 personal computer workstations to be in place by 1990, the graduation date for the first CMU class required to purchase their own computers.

The personal computing network will improve both the computer system's performance and its interactions with the users, according to Douglas Van Houweling, vice provost for computers and planning. Van Houweling explains that with a timesharing system, all the computing power is in the central machine, rather than at individual terminals. In a personal computing network, most of the computing power is in the terminals, and the central system supplies the required data. Thus, the response rate does not decrease as more people use the system and such things as color graphics and sound generation are possible "because you don't have to squeeze them through a long communication line back to a central computer," says Van Houweling.

The decision to invest time and energy in the creation of the personal network system grew out of administrators' assessment of CMU's strengths, reports Van Houweling. "We believe that for universities, especially those of modest size like CMU, to be absolutely effective, they must specialize in the things they are best at," he says. "It turns out that we are good at building software systems and understanding how they can be used in the university environment—we certainly know more about that than any manufacturer."

At the same time, administrators decided that they needed to work with an organization that could develop a system that supports thousands of users and then could effectively market the system to other colleges and universities. "We wanted to establish a teamwork arrangement with a major commercial vendor that would give them the maximum incentive to design a product," says Van Houweling. After discussions with various manufacturers, administrators selected International Business Machines (IBM) because of what Van Houweling terms their "strong commitment to both network personal computing and the use of computers in higher education."

In October 1982 CMU administrators signed a three-year agreement with IBM. CMU and IBM researchers are designing the network operating system that will allow thousands of personal computers to work together. IBM is providing all funds for the on-campus Information Technology Center in exchange for full ownership of the resulting inventions, patents, and copyrights. Van Houweling emphasizes that CMU is under no obligation to buy equipment from IBM, and "IBM has no obligation to give us a discount." Although both parties hope that IBM equipment will be the most attractive, the administrators decided it would be better not to commit the university to buying IBM materials, says Van Houweling.

Administrators divide the network's implementation into two stages. Phase I's goal is to place 400 personal computers at workstation clusters across the campus by fall 1984, while maintaining the current timesharing system. Researchers will begin introducing the personal computing network in 1985. Van Houweling predicts that 7,500 personal computers for students, faculty, and staff will be in place by 1990. In 1986 administrators plan to require all freshmen to purchase their own machines.

Because CMU's approach is innovative, a campus committee is investigating its potential impact on students and the campus environment, says Van Houweling. Committee members will explore such issues as the isolation of students from peers and instructors, whether or not terminals should be placed in dormitory rooms, and the educational implications of the system.

Computer Competency

Approximately 75 percent of CMU's students already use a computer each semester, according to a recent report. Van Houweling says that only the departments of art, music, and drama do not require an introductory computer course, although the art department has its own required course which stresses computer graphics. He estimates that 95 percent of the students have taken a programming course. From his own perspective, more students may be studying programming than is appropriate.

"We don't believe that all students should know how to program," says Van Houweling. "That's like saying all people who drive an automobile should know how to fix a carburetor. Like playing a piano well, programming requires talent. Some people have it and others don't.

"It's more important that people are able to use the computing tools that are directly relevant to their fields. Someone in fine arts needs to understand how to use computers to create images and examine designs—they don't need to become a Pascal programmer."

Van Houweling notes that students interested in expanding computer competency beyond their own disciplines can choose from a variety of computer science courses. They can also observe the application of computers in a number of other courses. For example, two English courses provide hands-on experience in text-editing and literary analysis.

As with the students, most faculty and staff members can already use computers in ways appropriate to their fields, says Van Houweling. His problem is not encouraging faculty members to use computers, but in supplying enough resources for all the things they want to do. Most departments have their own programs for familiarizing instructors with the computer facilities. Van Houweling is seeking external funds for a new campus committee which provides small grants to integrate computers into specific courses.

Administrators are establishing a consortium of universities to meet their commitment to share information on the personal computing network with their colleagues. Funded by the Carnegie Corporation of New York, the consortium will "make sure we're on target with our educational goals," says Van Houweling. The 15 members will receive support for software development and applications of the new system to their campuses. Van Houweling notes that participation by EDUCOM, a consortium of 350 colleges and universities interested in information technology, will provide an additional method for distributing news of CMU's progress.

Van Houweling urges administrators to recognize that computing is becoming as central to institutions as their libraries. They must become familiar with what others are doing and develop plans that are appropriate for their own goals and capabilities, he says. Van Houweling is pleased that CMU administrators have been able to develop an approach that allows industry, private foundations, CMU,

and other universities to play their appropriate roles in designing the new system. "The organizational structure is the foundation upon which this system will or will not succeed," he says.

Occasionally, Van Houweling allows himself to speculate on what CMU's personal computing network could mean for education. "I really think this is the first major application of technology to education since the printing press—I think it will have that kind of impact over the next ten to fifteen years." *P.B.*

For more information, contact Douglas Van Houweling, Vice Provost for Computers and Planning, Carnegie-Mellon University, Schenley Park, Pittsburgh, PA 15213. 412/578-2122.

Pepperdine University

Emphasizing Faculty Development

In summer 1982 Pepperdine University President Howard White announced that by 1984 students at Pepperdine should graduate with "an understanding of computing, word processing, communications devices and the integration of these to the extent that they can use this technology to solve problems...thus enabling them to compete in and contribute to the world in which we live." To meet this goal the university will work to make microcomputers available to all students and faculty members, develop introductory courses, infuse existing courses with computer-based instruction, and teach computer skills to faculty, White said. By 1984 the university hopes that all students will be spending at least 25 to 50 hours a semester (15 weeks) at the computer.

The president appointed an ad-hoc committee consisting of representatives from each school and two senior fund raisers to provide information to the president about what is involved in achieving computer literacy. One of the committee's recommendations included establishing blue ribbon committees in each of the university's schools to examine how that school can best increase computer literacy and what its definition of computer literacy will be, says committee member James Penrod, vice president of systems and planning.

Administrators in all schools are first focusing on helping more faculty members become computer literate. Faculty, administrators and staff members may enroll in a week-long seminar on computer literacy, offered prior to the university's annual Summer Computer Literacy Institute, a national conference for administrators. Approximately 35 faculty members participated in the in-house institute in 1982. Staff members from computer services give lectures, and a computer science faculty member teaches classes, introducing the participants to spread sheets, word processing and data base management packages, advances in communication devices, and the whole realm of computer literacy in relation to Pepperdine's facilities and goals.

Topics covered in the national institute to be held June 12-17, 1983, will include the history of computing, hands-on lessons with the microcomputers, office automation, increasing the administration's productivity with computers, and computer literacy strategies. Participants are administrators whose computer experience has been, for the most part, limited to making policy decisions. Each participant will have access to a computer, thus enrollment is limited to 35.

The university's professional development program, which is designed for faculty and staff members only, offers Introduction to Computers. The nine-week course meets twice a week and covers the fundamentals of computing, the role of computers in management administration and society, and the computer facilities at Pepperdine. Each class is taught by a separate guest speaker, usually from the university.

To encourage faculty to take advantage of these seminars and incorporate computer-based instruction in their courses, administrators now consider faculty members' computer activities during promotion and tenure evaluations. Computer literacy activities are considered in the same vein as writing a paper, Penrod says. The recommendation for this change came from faculty members on the president's ad-hoc committee.

Faculty members have demonstrated more computer phobia than the students, Penrod says. "One way to deal with it that is particularly successful at Seaver College (the liberal arts college) is working with a very small group of three or four faculty members. The Academic Computing staff gives them a good deal of individual attention with the understanding that when they feel themselves to be computer literate they will train fellow faculty members," Penrod says.

Courses for Students

The university offers three introductory computer courses for the students, and almost every department has at least one course that utilizes the computer. The communication department requires majors to take Communication in Action: The Computer Revolution, which reviews basic information-processing concepts and terminology and the role of the communications professional. The course does not require a technical background. The computer science department offers Introduction to Computer Science, which covers algorithms, structured programming, complex graphics, and problem solving with the Pascal programming language. The course's prerequisite is an introductory mathematics course. The Department of Education and Psychology offers a master of science degree in educational computing for elementary and secondary school teachers and administrators.

Coping with Computers, begun in fall 1982 as a joint offering of the natural and social science departments, is a very popular credit course intended for non-computer science students. Topics covered include the computer's basic structure and functions, and how to write a simple computer program, use word processing, and play computer games. Bob Gilliam, course instructor and professor of psychology, also discusses computers' history and future and the effects of computers on the quality of life.

To alleviate students' computer anxiety Gilliam puts the students in contact with the computer as soon as possible. "I bring two computers (an Apple II Plus and a Teraki microprocessor) to the classroom the first day and demon-

strate how to boot them up with floppy discs, enter data and run a simple program," he says. It is important, though, to give substantial explanation of the basic functions of a computer before confronting students with a computer, Gilliam adds.

Non-computer science classes that have incorporated computer-based instruction include an introductory statistics class that uses, among others, an analysis of variants package. Creative writing students employ the USSD Pascal Editor word processor for writing poetry and prose. Students in Man and Science, a combined chemistry and biology course, work with a program called Fisheries to determine the maximum number of fish that can be caught without depleting supplies.

The university is developing a plan to give students and faculty members the option to buy a computer at a very low cost, Penrod says. "It looks very favorable. We'll get significant reductions in cost and several companies would provide financing plans," Penrod says. "Some of the vendors are suggesting that they would run special seminars aimed toward faculty in the summer (1983). The students would begin training in the fall."

Penrod has found that acquiring new computers is essential to meeting the new demands. But another concern now is maintaining an adequate supply of professionals on the academic computing staff. "The competitiveness of business is very difficult to deal with . . . you have a continual situation where you have to train and retrain because when you get someone trained, business takes them away." *T.A.*

For more information, contact: James Penrod, Vice President, Systems and Planning, Pepperdine University, Malibu, CA 90265. 213/456-4594.

Marymount Manhattan College

Tools for Learning

When Marymount Manhattan College administrators decided to incorporate a computer literacy program in the liberal arts curriculum in 1980, the concept was considered very innovative, says Barbara Rich, associate dean and coordinator of the program. Today, explains Rich, the incorporation of computers into the liberal arts is still considered a new idea, but institutions across the country are increasingly recognizing the entrance of computers into our daily lives. "As society relies more and more on the computer for transmitting and generating knowledge, we are expanding our computer literacy program," says Rich.

The administrators and faculty's decision to include a computer literacy program, explains Rich, is an outgrowth of the liberal arts college's mission "to educate the socially and economically diverse population of the New York area by fostering intellectual achievement and personal growth and by providing opportunities for career development." Since computers are increasingly a part of everyone's daily routine, Marymount Manhattan College administrators view computer literacy (defined as the understanding by the learner of the uses of the computer, the capabilities and limitations of the computer, and the ability of the learner to utilize computer instruction and data analysis packages) as a necessary facet of career development.

The majority of Marymount Manhattan's 2,500 students are adult women who have been out of high school for at least ten years. Traditionally, according to Rich, women, especially older women, have more anxieties about computers and high technology than men do. Recognizing this, instructors attempt to alleviate students' anxieties by making them realize through exposure that a computer is a tool which, when asked the right questions, will give the proper response.

In order to alleviate students' anxieties, the administrators decided to educate faculty members on a volunteer basis, since most of them were computer illiterate. Rich works individually with instructors and shows them how to use the computer. She finds that once people "get their hands on the computer," most of their anxiety is gone. When faculty members feel comfortable with computers, they can work with students and include computers in the liberal arts curriculum, which Rich admits "doesn't happen over night." Foreign languages, science, psychology, and education professors now include computers in their courses. Rich hopes to raise the level of computer literacy among faculty so that they can employ computer instruction in courses throughout the six divisions of the college.

The data processing and business professors already have a working knowledge of computers. Many are adjunct professors affiliated with private industry. They know firsthand how the business world utilizes computers and are able to share this information with their students. Since Marymount Manhattan does not receive any direct advice from local companies, Rich explains that it is important for the college to have professors with non-academic experience.

Marymount Manhattan does not have a separate computer science department. Data processing courses fall within the Division of Natural Sciences and Mathematics. Other departments use the computer as a teaching tool. Administrators emphasize that computer literacy does not mean becoming a computer scientist. The use of computers in the classroom demonstrates to students that the computer is a tool for their academic pursuits. For example, says Rich, a Liberal Studies course uses computer simulation to examine how values effect community change. Students analyze a rural community and recommend changes. The computer exercise requires students to look at how to implement change and the values involved.

Students learn about the impact of high technology on society and the world through elective courses in a variety of departments with courses such as The Ascent of Man; Space: A New Frontier; The Computer, Science, and Society; and Science, Technology, and Society. Rich describes the latter course as an interdisciplinary, team-taught course focusing on the interaction of science and technology with society. The course examines the impact of scientific and technological developments on societies and human values, as well as how they influence social behavior. Specific issues include genetic engineering, cy-

bernetics and automation, future shock, space travel, and non-human intelligence.

To foster computer learning and discussion outside the classroom, Rich recently formed a Computer Club for students interested in discussing computers. The club encourages all interested students, not only data processing oriented students, to join. According to Rich, the group plans to coordinate a computer day at Marymount Manhattan in fall 1983. Computer knowledgable students will operate computer games, graphics, and programs in the main halls of various campus buildings to stimulate interest and counter anxieties. "When students see their peers operating a computer and are given the opportunity to simply touch it, they become much more interested and at ease," says Rich.

Rich advises other small liberal arts schools to set realistic goals for computer literacy and to have a central resource person to assist faculty members. At the outset of the program in 1980, about two percent of Marymount Manhattan students were computer literate. Rich hopes to increase levels of computer literacy by 20 percent each year. She estimates that slightly more than 50 percent of the students will be computer literate by 1984. She attributes this increase to the efforts of faculty members and administrators to integrate computers in the curriculum.

Rich cautions people "not to confuse computer literacy with a computer science major." By endorsing a computer literacy program at Marymount, the administrators are trying to prepare their students for functioning in the increasingly complex world. Rich lists a lack of time and funds as major problems in attempting to achieve campus-wide computer literacy. Small college budgets simply do not include enough money for all the necessary equipment, she says. In addition, she reports that faculty members cannot find the time to learn about computers and their potential.

Rich believes that Marymount Manhattan College is successful in integrating computers into the liberal arts program and in addressing the students' needs. Rich says, "We are living proof that a small, inner-city liberal arts college can integrate computers in the liberal arts curriculum. It can be done." *C.B.*

For more information, contact Barbara Rich, Associate Dean, Marymount Manhattan College, 221 East Seventy First Street, New York, NY 10021. 212/472-3800.

Hamline University

Requiring Computer Literacy

In fall 1980 Hamline University faculty members approved a computer literacy requirement for all students and a commitment to computer use in all disciplines. The requirement went into effect in fall 1982 for the class of 1986 and can be fulfilled through a proficiency examination, computer science courses, or a self-paced computer-assisted short course.

Each of these methods reflects the university's definition of computer literacy, according to Kenneth Jantzen, dean. He lists computer literacy's three facets as "the ability to use a computer and to communicate with computer and data processing personnel concerning the use of computers; knowledge of the limitations and capabilities of computers and their social, vocational, and educational applications; and ability to demonstrate (how) to write a simple computer program for the solution of some intellectual problem using a programming language such as BASIC."

In determining how to integrate computers into the university's academic life, administrators "decided that the computer is a basic tool for organizing and managing information in our society, and that any liberally educated person must be able to understand and use it," says Jantzen. Rather than introducing computers solely in the context of a student's discipline, they decided to create a computer literacy requirement that addressed the varied capabilities of the computer. Computer literacy is now one of the general education program's group I requirements, which also includes courses in languages and formal reasoning.

The university's interest in computer literacy began in the late 1970s when Jantzen and a faculty member in the mathematics department began discussing the necessity of computer growth at Hamline. In 1980 Jantzen formed a computer task force to examine the potential for computer literacy. Representatives from physics, economics, education, mathematics, modern languages, and political science wrote the computer literacy resolutions which were passed by the faculty in fall 1980.

At the same time, Hamline administrators began meeting with Control Data Corporation (CDC) executives to discuss how they might work together to develop a computer literacy requirement. CDC executives were interested in how such a requirement could be implemented and in how their PLATO system might be used more effectively at an undergraduate liberal arts college such as Hamline. They decided that the university would serve as a testing ground for their interests in exchange for equipment and consulting help. Hamline's basic equipment includes IST III PLATO terminals which operate online with CDC's main terminal and CDC 110 microcomputers.

Satisfying the Computer Literacy Requirement

During spring 1983, 130 students are enrolled in Computer Fundamentals, Introduction to Computers and Data Processing with BASIC, or Introduction to Computer Science with Pascal, the three courses which satisfy the computer literacy requirement. The latter two courses feature lectures and assignments which are completed at computer terminals located around the campus. In addition to learning the language and how to program, BASIC students examine the ways in which computers are used in business and the sciences and their impact on society. Pascal students also study these topics and learn about programming principles.

Approximately 35 students enroll in each one-credit language course each term. Jantzen recommends these courses to students who want a substantial introduction to the language and programming and desire a structured

learning situation. Computer Fundamentals is a self-paced one-fourth credit course developed by faculty members from a variety of departments. Administrators have tested it with students and faculty and staff members and continue to modify it based on participant response. Taking approximately 30 hours to complete, the course satisfies the university's minimal level of computer literacy, says Jantzen.

Computer Fundamentals begins with an introduction to PLATO and computers. It includes a ten-lesson segment on the history of computers, their operations, and their social impact. Students also complete a shortened version of a PLATO course in BASIC programming language. They next study word processing, including editing, formatting, and developing files. The course designers also have prepared a list of required readings on computers and society, which include John Kemeny's *Man and the Computer* and Adam Osborne's *Running Wild: The Next Industrial Revolution*.

As originally designed, Computer Fundamentals did not have a classroom component. At students' request, Jantzen has scheduled optional weekly meetings for students requiring additional assistance. He has discovered that some students need the motivation provided by an occasional group meeting.

In addition to the three courses, students can also fulfill the computer literacy requirement by completing a proficiency examination. Instructors currently use the Computer Fundamentals final examination. This includes the preparation of a review on one of the required readings, which test both knowledge and word processing skills.

Few students choose the examination option, according to Jantzen. He reports that reaction to the courses is positive, although some students are disappointed in the limited number of openings in the BASIC and Pascal courses. Staff members in the admissions office see an enthusiastic response to the requirement. "It is a very positive element in recruiting," says Jantzen. "Students feel Hamline has something special to offer in the way of computers."

Jantzen is pleased with faculty reaction to the requirement and surprised that the resolutions passed so easily. Hamline's approach has been to emphasize student proficiency rather than faculty development. "Our tactic is to raise up a generation of students who see the potential of the computer and feel comfortable with it," says Jantzen. "Student pressure will encourage faculty members to include computer applications in their courses – this is already beginning to happen."

Faculty members have completed Computer Fundamentals and participated in workshops led by CDC representatives. An Exxon Education Foundation grant is funding a small grants program for software development and faculty workshops for grant recipients to display their products and generate enthusiasm among their colleagues.

Jantzen emphasizes that the university is not promoting the development of computer science as a primary academic discipline. "Rather," he says, "we believe our intent is consistent with what is necessary for a high quality liberal education in our time." *P.B.*

For more information, contact: Kenneth L. Jantzen, Dean, Hamline University, St. Paul, MN 55104. 612/641-2800.

Drexel University

Microcomputer Requirement

"The computer is not an object of worship," declares Bernard P. Sagik, vice president for academic affairs at Drexel University. A technical institution with major programs in science and engineering, Drexel will begin requiring all freshmen to buy their own microcomputers in fall 1983. Sagik emphasizes that "the computer is but one of several means by which to achieve our academic goals and is not about to become the purpose of a university education."

Nevertheless, Sagik agrees with the statement by Martha Montgomery, head of the humanities and communications department, that "there is no significant sector of the economy which is not already computer dependent." Montgomery explains that Drexel has always taken a very pragmatic approach to education; 98 percent of the students spend up to 18 months in cooperative education jobs. "If we say we're preparing students for professional lives in the 21st century and don't get them used to computers, then we're lying to them," says Montgomery.

Drexel's emphasis will be on the computer as a tool in virtually every profession, says Sagik. He does not expect all students to become computer programmers. Rather, he would like students to learn how to make the best possible use of computers in their fields. Writers, he says, can use the computer for editing and rewriting, while graphic artists can test preliminary designs.

Short range goals at the university call for attention to the computer's capacities in word processing and editing. "Our approach this fall will be to get everyone comfortable with the machines," says Sagik.

More than 95 percent of Drexel's undergraduates already enroll in courses that require computer usage. Freshmen in the science and engineering track take a problem-solving course using FORTRAN. Business students learn COBOL problem-solving, and the department of humanities and communications has had a programming course requirement for five years.

To ensure that freshmen will quickly feel comfortable with their microcomputers, administrators will select equipment that is "user friendly," says Ray Ulmer, director of public relations. "We don't want students to spend countless hours worrying about memorizing code sequences," says Ulmer. In addition, instructors will be able to take their classes to a lecture on how to use a word processing package, and a psychology class is preparing a computer disk on how to use microcomputers. Graduate students in technical and scientific communications will operate a hot line that students can call for immediate assistance.

Faculty members are also learning how to use the microcomputers, says Sagik. He reports that nearly a third of the faculty already use microcomputers for word processing, while many others have experience with mainframe computers. Instructors are running courses for their colleagues, and Sagik anticipates that even the faculty with little computer experience will "have the panic and fear taken out of the machine and know how to do certain things with it" by fall 1983.

Faculty members have also been actively involved in determining what capabilities students' microcomputers should have. Sagik appointed a faculty committee representing all sectors of the university to define their undergraduates' computing needs. At the same time, the computer center staff compiled statistics on available microcomputers. After comparing their reports, the committee invited several vendors to give demonstrations. Administrators chose Apple Computer, Inc. to offer a new microcomputer, to be called the Apple DU, at a discount to all Drexel freshmen.

Both students and faculty will also gain an understanding of the computers' societal impact in an extracurricular seminar series planned for fall 1983. Sagik has tentatively scheduled seven lectures by local and outside experts on "why modern technology has such an enormous impact on the educational system." He also hopes to secure funding for videotaping and printing the lectures for distribution to students and other interested people.

Humanities and the Social Sciences

Throughout discussions on computer usage and requirements, faculty members in the College of Humanities and Social Sciences have kept pace with their counterparts in science and engineering, reports Montgomery. "The underlying agenda of the humanities department is to help technical majors understand the world in which they live and teach them to make intelligent choices," says Montgomery. "We've put our professional lives where our mouths are by showing we're ready for the introduction of computers across the board."

Because the college provides the general education program for the entire university, students take between eight and ten courses in humanities and social sciences, including five courses in Montgomery's department of humanities and communications. She predicts that all freshman courses in these areas will include microcomputer usage by fall 1983.

For example, students in composition courses will learn editing skills with the computer and use a software package that checks spelling and punctuation. Microcomputers will provide drills in correct grammar and usage in foreign language courses, and music students will identify melodic intervals in programs using a synthesizer board.

Montgomery is especially proud of a second semester freshman composition course that emphasizes critical reading and preparation of detailed analyses. Students use the Dialog database system to explore such section topics as the consequences of social change, professionalism as a literary theme, and the changing roles of men and women. "The computer takes the drudgery out of research and enhances the student/instructor relationship because the students work on the machines with a teacher and programmer in the room with them," says Montgomery.

Faculty members also demonstrate the range of computer applications through their personal research. Two faculty members are creating English and Latin concordances of John Milton's works. Students assist instructors in conducting telephone opinion polls and coding and analyzing the results in the university's survey research center. A music professor uses the computers in electronic music projects.

These examples demonstrate both the scholarly and creative uses of computers, says Montgomery. She urges her colleagues at other colleges and universities to recognize that computers are here to stay. "If you want to have any authority at all with your students, you have to learn how to use computers," she says. "In five years colleges that don't require computers will begin to die out for lack of students and funding."

Sagik says he cannot predict how computers will be used in Drexel's future academic programs. He anticipates they will be used for data acquisition, but emphasizes their future growth will require a learning process. "I would like to leave the leeway for the creativity of students and faculty to bring computers beyond the simple tool level," says Sagik. "But I think we first ought to have at least that for everyone."

P.B.

For more information, contact: Martha B. Montgomery, Head, Department of Humanities and Communications, College of Humanities and Social Sciences, Drexel University, Philadelphia, PA 19104. 215/895-2430.

Computer Vendors Donate Equipment to Colleges and Universities

As administrators and faculty members debate their long-term computing needs, several major computer vendors have introduced equipment and/or cash donation programs which address immediate research, equipment, and development requirements. In a recent telephone survey I discovered that most company spokespersons freely admit that their programs are a good way for potential customers to become comfortable with their equipment and thus more inclined to make future purchases from the donator. At the same time, several spokespersons emphasized their genuine commitment to education. Here follows a brief description of some of the activities of these companies.

"Computers are here and they're part of our lives," says Frances L. Carney, education grants coordinator for the Apple Education Foundation. "We want to help educators do what they can with them for the kids' benefit." Since 1979, the nonprofit arm of **Apple Computer, Inc.**, has donated nearly $1 million worth of microcomputers to educational institutions for the "development of new learning methods." The usual donation is a complete Apple IIe system. Grantees distribute the software packages developed with Apple equipment through the publisher of their choice.

In March 1983 the foundation awarded equipment for

activities ranging from the development of computer-aided instruction modules in legal decision-making and problem solving at the University of North Carolina at Chapel Hill to Carleton College's program in international diplomacy, which includes a computer simulation of the negotiations conducted during the imprisonment of the American diplomats in Iran.

These awards marked the last activities funded under Apple's first donation program, reports Carney. Based on surveys with grantees and professionals in the field, staff are preparing guidelines for a new program which will focus on teacher education. Carney expects the new guidelines to be ready for distribution in June 1983. For more information, send a postcard to Grants Information, Apple Education Foundation, 20525 Mariani Ave., Cupertino, CA 95014.

The emphasis at **Atari, Inc.'s** Institute for Education Action Research is on "finding new and innovative uses for home computers," says A. J. Sekel, public relations manager. Atari awards grants of equipment and/or cash, depending upon the applicants' needs. During its first year, the institute has supported a project at the Bank Street College of Education on how electronic technologies, such as microcomputers, affect children's development. Additional projects include work by psychologists at California State University at Fullerton who are developing children's problem-solving and critical thinking skills, and the construction of a model space shuttle which uses computer integrated simulations by students at Greenfield Community College.

Persons interested in receiving additional information can write to Sandra Williams, Manager, Program Development, Atari Institute for Education Action Research, Atari, Inc., 1196 Beregas Ave., P.O. Box 427, Sunnyvale, CA 94086. Application to the institute is a two-step process, including an initial screening of project abstracts by institute staff before acceptance of full applications. The institute also coordinates a scholar-in-residence program for in-house research projects.

Believing that the United States is headed for a shortage of engineers in the face of expanding technological needs, **Control Data Corporation** announced its 110 grants program in February 1983. According to a company spokesperson, Control Data will award PLATO computer-based pre-engineering courses and Control Data 110 microcomputers to 110 colleges and universities across the country.

During the program's first phase, grantees will use the PLATO materials in mathematics and science courses for pre-engineering freshmen and sophomores. They will have the option of applying for the program's second phase, which will include the integration of PLATO materials into other disciplines at the high school level.

A company spokesperson reports interest in funding activities at various types of institutions. Although participants in the southern and southwestern United States will have been chosen by the time this issue of *Forum* is published, administrators in the east, southeast, or midwest may call 800/328-1109 (outside Minnesota) or 612/853-7518 (inside Minnesota) to learn whether or not their activities would qualify for the program.

Digital Equipment Corporation is also interested in the education of future engineers, according to Nancy Dube, manager of corporate contributions. During 1982, Digital donated more than $45 million in equipment and cash contributions to colleges and universities for "the enhancement and expansion of their engineering and computer science programs, the encouragement and support of students pursuing careers in engineering and science, and the encouragement of greater research activity."

Examples of funded activities include special programs targeted at helping such groups as minority students, women, and urban residents prepare for engineering and computer science careers. Program staff prefer a "major Digital presence" in the community in which an educational institution is located. "We look at all contributions as investments which are of mutual interest to the company and the educational institutions in terms of developing a long-term relationship," says Dube. For further details, write Corporate Contributions Administrator, Digital Equipment Corporation, 129 Parker Street, PK3-2/K36, Maynard, MA 01754.

Administrators interested in receiving donated equipment from **International Business Machines Corporation** (IBM) often have to wait for "the knock at the door," according to Peter Singer, program manager in information activities. Managers at various IBM offices have the authority to donate surplus equipment to nearby institutions or make charitable donations based on a particular need, such as training the handicapped. For this reason, local managers try to keep informed on what colleges and universities are doing in areas which may be of interest to IBM.

In March 1983, IBM announced a computer literacy program for secondary schools, which is also based on their selections rather than submitted proposals. Twelve teacher training institutions in California, New York, and Florida will receive 15 personal computers each for the training of in-service teachers at nearby high schools. In turn, the 84 high schools will receive 15 personal computers to assist in the integration of computer instruction into traditional courses. The Educational Testing Service is assisting with the training.

In addition to standard research contract arrangements, IBM also awards unsolicited grants to departments and graduate students for unrestricted research. Information on these programs is available from IBM Director of University Relations, IBM, Old Orchard Rd., Armonk, NY 10504.

Although **Wang Laboratories, Inc.** has been active in donating equipment in its home state of Massachusetts, a company spokesperson declined to discuss a future program which will be donating equipment in other parts of the country.

Readers may also wish to investigate donation programs organized by office automation suppliers such as **CPT Corporation.** CPT recently expanded its donations of word processing equipment to areas outside Minnesota. Activities must focus on producing more science and high technology graduates, says Donna Munger, manager of corporate communications. She asks applicants to demonstrate their commitment by fostering students' literacy in science and mathematics and interest in nigh tech careers. For more information, write to Munger at CPT Corporation, P.O. Box 295, Minneapolis, MN 55440. *P.B.*

Additional Programs

Allegheny College

Tailoring Computer Instruction to the Discipline – The Allegheny College task force assigned by the new president to "bring the college into the computer age," decided that along with new equipment, student and faculty computer literacy must be integral parts of their goals, says David Anderson, chairperson of the Technology Task Force and associate professor of psychology. The college's definition of computer literacy includes "recognizing the use of the computer as a tool in a wide variety of disciplines (and) simply being able to interact with a machine," Anderson says.

"We see computer literacy as something to be definitely integrated into our liberal arts curriculum (and) we want to make sure that students understand that computers are not limited to computer science courses," Anderson says. To prepare students to use computers for work unique to their disciplines in upper division courses and jobs, the faculty have approved a computer literacy course beginning in fall 1983 that will examine closely the use of computers in different disciplines. When faculty incorporate more computer-based instruction in their courses, students will already have the basics.

All students in the course will attend classes in the beginning of the semester given by a computer science department faculty member on such traditional topics as computer logic and variables, but not programming. During the last two-thirds of the semester students will join one of three sections which correspond to the three divisions at Allegheny: the humanities, social sciences, and natural sciences. At first the sections will have a limited enrollment of 25 and be open to any student. In the future, instructors will design the course to accommodate the entire freshman class and include more sections on different disciplines.

The course instructors are not computer scientists, but, instead, include a philosopher, chemist, and psychologist (Anderson). They each use computers in their work, understand computers, and consider themselves computer literate, Anderson says.

Some of the topics that may be covered in the humanities section include social and ethical implications of computers, their speed and capacity, elementary data structures, bibliographical programs, indexing, and artificial intelligence. Some of the social science topics are likely to include the uses of the computer in the workplace and politics, economic models, and available software packages. How the computer is used in the natural sciences for data collection and analysis, number systems and error analysis, computer graphics and mathematical modeling are a few of the areas to be discussed in the natural science section.

To develop faculty literacy the task force has planned three, three-day workshops to be held in summer 1983. They expect approximately 30 of Allegheny's 110 faculty to enroll and are prepared to offer beginning to advanced level workshops, taught by Anderson and a chemistry professor. The beginners' sessions will emphasize "what you can do with the machine," and introduce programming and computer jargon, Anderson says. At the intermediate sessions they will discuss software, including what is available and how to purchase and modify packages. Faculty members experienced with computers will work on independent projects, developing computer courseware or simulation packages for their own courses. Over the 1982 Christmas break 38 Allegheny faculty members participated in two, one-day computer literacy workshops sponsored by the college and pitched to humanities faculty members. Many of the topics covered were the same as those planned for the summer workshops, with the addition of home computing.

Existing courses in the psychology, English and other departments are already using the computer. One of the more unusual classes planned for the fall is based on the research of a logic and philosophy professor and a poetry professor who are programming a computer to write poetry, says Anderson. The new computer literacy course and faculty workshops should encourage faculty members to include more computer-based instruction in their courses. "The only way for computer literacy to fly is to convince faculty in all these different disciplines. to start using computers in their courses," says Anderson. *T.A.*

For more information, contact: David Anderson, Chairperson, Technology Task Force, Psychology Department, Allegheny College, North Main, Meadville, PA 16334. 814/724-5361.

University of California, Santa Barbara

Computing in the Arts and Humanities – Based on his experiences teaching programming languages to groups ranging from nine-year-old computer campers to older women returning to college, mathematics professor Marvin Marcus designed an interdisciplinary studies course on computers open to all students at the University of California, Santa Barbara (UCSB). Computing in the Arts and Humanities emphasizes programming languages and their applications. Marcus, an associate vice chancellor for research and academic development, has taught the course to almost 600 students since its first offering in fall 1982.

Computing in the Arts and Humanities grew out of Marcus' experience in UCSB's Microcomputer Laboratory. Begun in 1979 with state funds to help older women retrain for technically-oriented careers, the laboratory has expanded with aid from the National Science Foundation and the U.S. Department of Education Fund for the Improvement of Postsecondary Education. During spring 1983 approximately 1,000 students are using its 42 Apple II and IIe computers, which are joined together by a Corvus networking system.

The Microcomputer Laboratory handles more than 50 percent of all undergraduate computing, according to Marcus. Because its operating costs are low, the laboratory is able to charge bargain rates in comparison to the central computing facility and attract the business of a variety of academic departments, reports Marcus. Instructors use the laboratory for subjects ranging from music theory and psychology to composition and FORTRAN programming. The staff also sponsors a summer day camp for children and offers short courses in word processing and financial management.

Marcus designed the new course to help students "learn how to set and solve some interesting problems, code them in a computer language, and run them on the computer." He proposed the course in summer 1982 after a committee appointed by the chancellor recommended a campus-wide computer literacy requirement, which was not implemented. He stresses that his course is not easy although "it is organized to be flexible in the level of difficulty" because of the varying levels of expertise students bring to the course. He rates the heterogeneous audience both enjoyable and challenging.

Students attend lectures and spend between three and four hours in the laboratory each week. They receive assistance from the part-time student consultants who staff the laboratory under the direction of a full-time manager.

Marcus divides the course into four sections: BASIC programming language, Pascal programming language, language processing, and information management. Course assignments focus mainly on text analysis programs, such as word concor-

dances, rather than technical topics. In an early programming assignment students create an electronic phone book that alphabetizes names and calls up addresses and phone numbers by last name. They also study word processing and such information management techniques as organizing, creating, and retrieving files.

Although Marcus presents a few lectures on the history of programming languages, he does not spend much time on the impact of computers in society. "I take that to be more or less self-evident because of such things as *Time* magazine's machine of the year article (*Time*, January 3, 1983)," says Marcus. "People have heard enough of that through the public media. I want to give them very specific skills."

Marcus emphasizes that he is not trying to train computer scientists. He wants his students to be able to "intelligently use the inexpensive microcomputers that are permeating every office and laboratory situation. . . . My goal is to train people to perceive creative and unanticipated ways in which they might be able to use this technology in their own fields," says Marcus.

In designing computer literacy courses Marcus advocates the development of both software packages and accompanying texts. "They must be carefully joined together so that each augments and explains the other," he says. Although this approach takes skills and experience, Marcus explains that it is less expensive and time-consuming to design than a completely computer driven course which requires 500 man hours for each student hour of contact. *P.B.*

For more information, contact: Marvin Marcus, Associate Vice Chancellor of Research and Academic Development, University of California, Santa Barbara, Santa Barbara, CA 93106. 805/961-4188.

Colgate University

Computing in the Social Sciences – After receiving release time from the dean's advisory committee to design a faculty course on computer applications in the social sciences, Assistant Professor Joseph Wagner surveyed his colleagues at Colgate University to determine their interest. Their response was overwhelming, says Wagner, a political scientist. He heard from faculty members in the humanities and natural sciences, as well as the social sciences, and from secretaries and even the football coach. With funding from the faculty development committee, he taught an eight-week evening course to eight social science faculty members in spring 1982.

The course provided an introduction to computers and advanced statistics and did not require previous experience with either. Wagner also considered the course an ideal refresher for people whose computer skills had become outdated. He taught the course in a campus building which housed a bank of computer terminals tied into the campus' Digital Equipment Corporation DEC 10.

Wagner intentionally limited the class size to ensure hands-on training and personal attention to each student. He discovered that people unfamiliar with computers often feel great anxiety, despite their enthusiasm, and require immediate assistance when they encounter obstacles. "People often get discouraged," says Wagner. "I was there to help them work through problems and get over hurdles." Faculty members also appreciated being taught by a colleague who understood their needs, rather than a computer specialist, says Wagner.

The course began with an introduction to text editing and proceeded through statistical procedures with the Statistical Package in the Social Sciences (SPSS). The faculty members designed programs for data analysis with data sets that Wagner had created. Part of his job, says Wagner, was teaching the faculty members a different way to think about the world. "The skills required for using a computer are very different than those in which most people have experience," he says. "The language requires much more care and precision than people are used to."

Wagner rates his course a limited success. Because of other demands on their time, the faculty members were sometimes unable to attend class or spend the weekly four hours on reading and assignments that Wagner recommended. Despite these difficulties, the faculty members were enthusiastic about the course, and Wagner is looking for outside funding to hire someone to offer the course again.

Freshmen in the social sciences are also learning how the computer can be used in their disciplines in Methods and Behavioral Social Science, taught by Wagner and a professor from the sociology and anthropology department for the first time in fall 1982. Students learn how to program in SPSS and receive hands-on training in a laboratory section.

In teaching the two courses Wagner learned that "less is better." "People who are comfortable with the computer often forget how many difficulties you can encounter in becoming familiar with the machine," he says. "I needed to lower my expectations and spend time working through problems with them." Wagner looks forward to a time when enough students are familiar with computers to be able to assist their peers.

Colgate University does not require a computer course, although many students complete noncredit short courses or an introductory computer science course, says Wagner. He takes what he refers to as a "minimalist position" on computer literacy: people should be able to communicate with computer specialists and know what they are talking about and what can be done on the computer.

"People benefit from having some knowledge of what computers can do," says Wagner. "They should also realize the computer isn't the answer to all of our problems. We need to bring the worlds of the people who use the computer and of those who don't, together." *P.B.*

For more information, contact Joseph Wagner, Assistant Professor, Department of Political Science, Colgate University, Hamilton, NY 12246. 313/824-1000, ext. 521.

Gallaudet College

Increasing Computer Assisted Instruction – Gallaudet College, a higher education institution serving deaf people, uses the computer as a tool for teaching the liberal arts. According to James Madachy, dean of the College of Arts and Sciences, two-thirds of Gallaudet's students are computer knowledgable because of the utilization of computers in the language program.

A planning committee, composed of Madachy, the vice-president for academic affairs and his assistant, four interested faculty members, and the director of computer services and his assistant, meets regularly to plan computer usage for students and faculty. Madachy explains that computer assisted instruction (CAI) has been used by the faculty for approximately five years as part of an English program for second-language learners, since English is a second language for some hearing-impaired people. The CAI system does not replace the teacher. Rather, it allows instructors more time to pursue other teaching related activities by performing tasks tirelessly and establishing dialogues with students, reports Madachy.

Madachy notices little computer anxiety among students. Deaf people are visually oriented, so computer usage seems natural to them, he explains. Also, students learn to use the computer through a Hello Program on the computer, which Madachy terms, "a fun way of teaching them about computers." The computer also functions as a tool for learning in other disciplines, such as

mathematics, chemistry, home economics, and Russian.

Madachy says that the computer committee urges faculty members to become familiar with computers. Recently, 42 of the 130 faculty members registered for a voluntary faculty computer course. Their philosophy is that training efforts should concentrate on faculty, since two-thirds of the students learn about computers through the language program and others learn from courses in other disciplines. Madachy notes that today's junior and senior high school students receive computer instruction, which means that faculty members must prepare themselves for their arrival on college campuses.

One of the strengths of Gallaudet's computer usage program, according to Madachy, is that the computer offers immediate positive and negative reinforcement. "The CAI program does not accept errors. Hearing-impaired persons benefit fr m this method," he said. "As when learning any language for the first time, usage and how to form a sentence must be drilled. By not accepting mistakes, the computer teaches a perfect English pattern."

Madachy does have several caveats for any institution developing a computer program. Even though the faculty approved a computer science major for fall 1983, they are concerned about the future role of the computer. It is possible, explains Madachy, that many of today's computer science students will be unemployed in five to ten years. He believes rapidly increasing computer technology will result in the use of standard English as a programming language, thus eliminating the need for programmers trained in COBOL, FORTRAN, BASIC, and other computer languages.

Madachy advises institutions to consult with someone familiar with the computer industry before purchasing equipment. The consultant and computer knowledgable faculty must then determine the exact needs of the college. Systems must be compatible with present equipment. Also, wonderful equipment serves no purpose if it is not used to capacity. In addition, explains Madachy, computer technology is moving so rapidly that equipment is outdated daily and no one can foresee which computers will be available in three to four years. All of these concerns must be weighed, he says, but the key is for faculty and administrators to work with an expert to assess the needs of students and faculty. *C.B.*

For more information, contact: J.L. Madachy, Dean, College of Arts and Sciences, Gallaudet College, Kendall Green, Washington, D.C. 20002. 202/651-5000.

George Mason University

Computers in Contemporary Society—Three hundred freshmen will begin George Mason University's new Plan for Alternative General Education (PAGE) in fall 1983 with a required computer literacy course. Computers and Contemporary Society is an interdisciplinary examination of topics ranging from robotics and information processing to security and personal computing.

Course coordinator Murray Black, associate professor of engineering physics, defines computer literacy as "the realization of the use of computers in today's society, how (we) fit into this scheme, and how (we) might use computers to become productive citizens." His course emphasizes how computers are used in various disciplines rather than the development of programming skills.

The computer literacy course mirrors the approach found in all PAGE courses. Senior faculty members from a wide range of disciplines will apply their specialties in new ways to examine "concepts and problems in contemporary society," says Jan Cohn, chairperson of the English department. Cohn is one of four faculty members who developed PAGE with a grant from the Virginia State Council of Higher Education. She and her colleagues from biology, sociology, and decision sciences designed courses that integrate information found in traditional introductory courses and emphasize oral and written communication, as well as computer literacy.

PAGE designers grouped courses around the themes of Symbols, Codes, and Information and Values, Themes, and Cultural Conflicts. Computers and Contemporary Society fits into the former category as do Reading the Arts, which examines symbolism in art, and Scientific Thought and Processes, which introduces scientific principles. Courses in the second theme include Cross-Cultural Perspectives and Contemporary United States. Instructors will emphasize the connections between each theme's courses in two weekly lectures.

As with all PAGE offerings, the computer literacy course is the product of an intensive development process by faculty members from several disciplines. The resulting course is 70 percent content and 30 percent methodology, says Black. PAGE students will attend two weekly Computer and Contemporary Society lectures taught by faculty members from nursing, education, engineering, psychology, computer science, and information systems. In addition, they will participate in small group sessions, led by the lecturers, which will provide opportunities for further discussion and student reports. Students will gain hands-on experience in programming laboratories.

Because of the close working relationships between PAGE faculty members, the computer literacy instructors will be able to introduce various topics and have them amplified in later courses, says Black. For example, he will introduce the similarities between writing a computer program and writing a symphony. Instructors will also teach the computer skills necessary for other PAGE courses, such as the use of data sets and simulations.

PAGE developer Frederick Sitt, chairperson of the Decision Sciences Faculty, rates the enthusiastic community of 46 scholars created by PAGE as one of its most important facets. Cohn hopes that PAGE will break down the walls between the humanists and social scientists who know nothing about numbers and graphs and their counterparts in the sciences and other social sciences who view their work as vague and pointless. In summer 1983 Sitt will host a computer literacy workshop for all PAGE faculty members in response to their interests and to encourage them to include computers as course materials. *P.B.*

For more information, contact: William Lankford, Director, Plan for Alternative General Education, George Mason University, 120 Finley Building, Fairfax, VA 22030. 703/323-2044.

Guilford College

Training for the Future—Since 1848, faculty members at Guilford College, a Quaker liberal arts institution, have committed themselves to training responsible and enlightened leaders through the liberal arts. According to Elwood Parker, chairperson of the mathematics department and the computer committee, both administrators and faculty members view computer learning as a tool for preparing their students for the future.

The number of students at the college of 1,600 full and part time students who are familiar with computers has increased from 150 to 600 in the last two and a half years, explains Parker. He believes that Guilford College is successfully integrating the computer into the curriculum. As early as the 1960s, Guilford has a computer arrangement for students and faculty through a hook-up to North Carolina, North Carolina State, and Duke Universities. By 1978, Guilford faculty members required all freshmen to take Interdisciplinary Studies, which included an introduction to computers. Despite faculty support for inclusion of computer learning in the course, administrators dropped this facet of Interdisciplinary Studies because computer facilities could not handle the increased usage.

In the meantime, the administrators appointed a computer system study committee, composed of two faculty, two administra

tors, and the computer services manager. They meet regularly to assist faculty development and forecast future needs of the college. The committee is currently examining how the faculty will adapt to students' increasing familiarity with computers. "The whole question of student exposure (to computers) is something that colleges are not going to have to deal with," says Parker. "Elementary and secondary schools today are exposing and teaching their students about computers."

To increase faculty familiarity with computers, computer knowledgable faculty members work with their less prepared colleagues. Trust funds provide small grants for faculty development in computer-related areas. Other funds give faculty an opportunity to attend workshops in their fields, such as social history and use of the computer, computer controls and auditing, word processor in college composition courses, and the impact of mini and microcomputers in the accounting profession.

Undergraduates are gaining familiarity with computers in a variety of courses. During the 1982–83 academic year, 31 courses ranging from Formal Logic to Historical Geology include computer use. For example, in the latter class, students do a computer simulation of a 440 mile region of earth and the geological features beneath this landscape. Student teams "buy" core samples to obtain drilling rights for finding oil, says Parker.

Results of a fall 1982 faculty computer survey demonstrate that the faculty overwhelmingly supports increased use of computers on campus. According to Parker, the faculty endorses the idea of including a computer component in the required freshman interdisciplinary studies program beginning fall 1983 to give students elementary, hands-on computer experience. The emphasis will be on other disciplines and the computer will be used as a tool for learning. Parker predicts that by 1985, 75 percent of the students at Guilford will have some knowledge of computers.

Parker emphasizes that administrators who want to integrate computers into the curriculum first must convince the faculty of their importance, since faculty traditionally have influence in curriculum development. "The faculty feels strongly that the computer should be used as a tool for learning the liberal arts," he says. *C.B.*

For more information, contact: Elwood Parker, Chairperson, Department of Mathematics, Guilford College, 5800 West Friendly Avenue, Greensboro, NC 27410. 919/292-5511.

Hollins College

Computer Internships – In its effort to promote computer literacy, the computer science department at Hollins College, a women's college, provides internships with computer companies, introductory computer courses, and computer instruction for faculty members, says Barbara Kurshan, director of academic computing services. Computer-based instruction enables students to get more feedback on their work, exposes them to different ways of learning, and acts as a common bond between disciplines and departments, Kurshan says. Computer literacy for women students is particularly important – "once a woman overcomes her fear of machines enough to master a computer, she gains tremendous confidence," Kurshan says.

Recognizing students' need for exposure to more advanced computing, Kurshan developed the January internship program with computer companies in 1978. Since then the college has acquired the more advanced computers, but she continues the internships and their popularity has increased among students majoring in computer science, as well as those from other disciplines. The internships offer the students the opportunity to apply what they have learned, be exposed to the "real world" of computers, and focus on a single project, Kurshan says. The internship also increases students' job opportunities and offers employers the opportunity to find the best employees, Kurshan says. Four students have gone to work where they interned.

To participate, students must have taken two computer programming courses and be familiar with word processing and the editor on the school's system, a Digital VAX 11/780. The interns contract to work for 30 hours a week for one month on their project. "I don't accept the employer as a sponsor unless he has a tangible project," Kurshan says.

One intern worked at EDUCOM in Princeton and wrote a report on computer literacy projects in higher education that was used to apply for a grant that she will work on in summer 1983. A history major produced a teaching unit on word processing for teachers to use with their students in a local junior high school computer laboratory. An economics major and a psychology major produced a mailing program for marketing for a local Apple dealer. Another student worked for Digital Equipment Corporation, designing graphics that can be made into transparencies and used as teaching aids by teachers. Most projects have been very successful for the students and the employers, Kurshan says.

Introductory courses that prepare students for more advanced computer work or simply serve to make students computer literate include Introduction to Computer Programming, which teaches digital computer programming with applications in mathematics, statistics, and the physical and social sciences. Computers and the Problems of Society satisfies a divisional requirement and covers how computers can be used to solve human problems and whether computers are "causing a global revolution of social change," the syllabus states. Fundamentals of Computing Through Word Processing has proved very popular with humanities and social science students, though it does not fulfill any requirements, Kurshan says. Approximately 80 to 100 students participate in the short seminars Kurshan offers eight times during the semester on how to use the college's system.

Numerous other departments use or are planning to use computers in their courses, reports Kurshan. Two professors, with Kurshan's help, are working to increase the visual component of their art history course by making microcomputer visual discs containing 40,000 separate images available to students. Students in the Russian department use the computer to review lessons and vocabulary and to test what they have learned. Political science students may soon be testing their solutions to international conflicts on the computer.

Kurshan's advice for people interested in starting an academic computing program is, first, "don't try to do everything at once." Secondly, to encourage faculty use of computers in their courses, make sure the faculty members have separate funds available for computer development. "When we started the administration was willing to budget through my department, so the faculty didn't have to give up something from their budget to add computing," Kurshan says. She showed faculty members how to include computer packages by changing just one part of their course and to set up and run the software. She also wrote instructional sheets for the students. The result is that 30 of the approximately 70 faculty members use computers in their classes and her role has changed from preacher to teacher. *T.A.*

For more information, contact: Barbara Kurshan, Director, Academic Computing Services, Hollins College, Hollins College, VA 24020. 703/362-6541.

Indiana University

Expanding Computer Facilities and Literacy – To help double the number of computer literate students by 1987, the state and Digital Equipment Corporation awarded Indiana University several equipment grants. "There's been a phenomenal pent-

up demand for computer time," says Daniel DeHayes, dean and director of Bloomington Academic Computing Service (BACS). "Computing literacy is only really attainable if you have continued dealing with the computer." Instead of increasing the number of introductory computer courses, the administrators decided to increase students' overall exposure to computers. "We make an analogy between becoming computer literate and literate in French – it's not done by taking one course," says DeHayes.

In 1981 the state government gave the university $7.425 million for new equipment, and in 1983 Digital awarded $300,000 to the university. With these funds the computer center is replacing its 66100 Control Data Corporation computer and CYBER 172 with a CYBER 17855. The center will soon acquire its sixth Digital Equipment VAX 11-780 and already has a PRIME 750. The grants should be used to expand computer technology to non-traditional disciplines through faculty development, design computer-assisted instructional materials, and promote students' acquisition of computers, DeHayes says.

"A lot of faculty have identified the need for a concentrated effort to really encourage, as opposed to require, students to take intro courses," DeHayes says. Therefore, BACS staff members are developing a non-credit introductory computer course that will employ video tapes and the PRIME user friendly system. The business school and the computer science department each already offer an introduction to computer programming course. The computer science course enrolls 5,000 students a year; many are arts and science students who are required to take either a mathematics or computer science course to fulfill general education requirements.

To help faculty members incorporate computer-based learning in their courses and develop software packages, the university sponsored a conference for I.U. faculty in February 1983 on Teaching and Computers, in which approximately 500 of the 2,300 faculty members enrolled. Session topics included enhancing students' productivity with computers, academic computing at Indiana University, and overcoming obstacles to computer literacy. Some of the workshops examined the uses of the small computer in higher education, computer-assisted instruction for a variety of disciplines and PLATO interactive auction markets.

In December 1982 BACS, along with other campus groups, developed a computer training program for faculty members. The software developed in these sessions by faculty, an instructional designer, a programmer, and a graphics specialist, is being tested and should be ready by September 1983. BACS staff are developing a package to help teach this training program. To provide a forum for exchange of ideas between BACS and the faculty, BACS also created the Workshop for Computer-Based Instructional Support.

Campus projects which bring computers to non-traditional disciplines include using computers to develop audio visual materials for faculty members, computer-based lessons in early childhood development, language lessons in vocabulary and grammar, and a labor studies collective bargaining simulation package. The school of journalism computer-based lessons have received national attention and include computer evaluation of news stories and photograph cropping.

BACS administrators are very concerned about making the computer available to all parts of campus and enabling interaction between computer terminals. The computer center recently made their interactive computer-based learning system, PLATO, made by Control Data, available to all students. A new campus group provides advice to students and faculty interested in purchasing a computer and plugging into the university system, says DeHayes.

The most serious problem DeHayes faces is "the whole notion of a reward and motivation structure for faculty. Students really enjoy using the computers, but what's the motivation for faculty to spend time to design course ware and where does that fit into the whole faculty evaluation process? And once you have the faculty evaluators convinced, how do you convince the faculty that it's going to be considered highly?" *T.A.*

For more information, contact Daniel DeHayes, Dean and Director, Bloomington Academic Computing Services, Indiana University, Bryan Hall 7, Bloomington, IN 47405. 812/335-1053.

Rutgers, The State University of New Jersey

The Artist's New Tool: Computers – Interest in computer art has grown as computer graphics, real-time animation, and computer simulation techniques have developed, says Philip Orenstein, associate professor of art and developer of the Mason Gross School of the Arts' computer workshop at Rutgers University. But computer art workshops only became possible with the advent of the very accessible microcomputer and software, Orenstein says. Although the field of computer art is vast, the school's resources and avant-garde approach to art has restricted its focus to the use of computers in the fine arts, such as painting and sculpture; in graphic design, such as advertisement copy and books; and graphic design for electronic publishing software for the home market, including computer generated animation, says Orenstein.

In 1978 Orenstein started the computer laboratory at Mason. He now offers four computer art courses, and administrators recently approved a proposal to expand the number of courses and equipment beginning in fall 1983. Applications to the existing introductory computer art course increased five fold between 1982 and 1983, from 30 to 150. This sort of interest motivated the curricular changes, Orenstein says. The new courses will be for students not majoring in art, as well as meet the needs of students interested in concentrating in computer art.

In Introduction to Computing for Art Making, to begin fall 1983, students will learn elementary programming and gain an understanding of the theory and operations of computers in art making. This course differs from regular computer literacy courses because "we tend to ignore basic data base management and mathematics and deal with manipulation of graphics," says Orenstein. Being literate means primarily having an understanding of the equipment that allows one to be flexible enough to adapt to technical changes, Orenstein says. Eventually vendors will produce computer art packages that require little computer knowledge to use, but presently "it's a period of re-tooling and change," Orenstein says.

Introduction to Computing for Art Making is the prerequisite for the existing two-semester Computer Art I course, which begins with simple computer languages, graphics, and animation. The second semester covers more advanced computer graphics, high level machine language routines, sound generation, and software packages.

Students concentrating in computer art and other interested students will take three advanced courses, including Art and the Computer; Art, Technology and the Computer; an advanced graphics course; and Advanced Experiments in Computer Art, in which students will prepare computer art work for their senior show. Students have access to the computer laboratory, which has six Apple II and Apple II Plus computers.

Orenstein now teaches most of the courses but he has trained three faculty members to take over while he is on his 1983–84 sabbatical. During summer 1982, 12 faculty members and graduate students participated in his one month workshop to learn BASIC for graphics, elementary programming, and theories on computer art.

Persons interested in developing computer art courses should "start now," Orenstein advises, as opposed to waiting for more sophisticated equipment. When introducing computer art to Rutgers, Orenstein's main problem was changing the minds of "people with money and the decisions to make" about the im-

portance and popularity of computer art. Despite the tremendous popularity of the courses and computers' recent widespread publicity, he still has to defend his program to administrators. He has his arguments down pat: the demand for computer art courses is tremendous; electronic publishing is an economically viable field for commercial and other artists; and the enrollment drop art departments across the country are experiencing because students are being told to go into high technology fields, may be reversed when they discover that "high tech is in the arts." *T.A.*

For more information contact: Philip Orenstein, Associate Professor of Art, Mason Gross School of the Arts, Rutgers, The State University of New Jersey, New Brunswick, NJ 08903. 201/932-9078.

University of Washington

Serving the Campus Community – Administrators at the University of Washington Academic Computing Center (ACC) are taking a pragmatic approach to computer literacy, reports John Sobolewski, center director. "As a service organization we're interested in helping students, faculty, and staff members use the systems that we provide," says Sobolewski, who is also an associate professor of computer science and medicine.

Each year ACC staff members teach more than 80 noncredit courses on various aspects of the campus computing systems to 2,000 people on a first-come, first-serve basis. Potential users can also teach themselves how to perform basic computer applications and attend demonstrations by vendors. In addition, center staff members sponsor informal weekly meetings to discuss problems and concerns of the more experienced users. These efforts exemplify Sobolewski's definition of computer literacy – an understanding of what computers can do and how they can increase productivity in specific fields.

Students attend ACC courses for personal development and to learn how to complete course assignments that necessitate computer work, says Sobolewski. University policy does not require computer courses or competency for all students, although computer science and engineering programs include extensive computer use. Because of the demand for credit courses by students majoring in these two programs, other undergraduates must turn to ACC for noncredit courses to learn about computers, says Sobolewski.

Popular ACC courses are Introduction to Computing, Introduction to Microcomputers, and Word Processing Using QUILL. In the former course instructors present an overview of computing in two two-hour sessions. The four-hour microcomputer lecture covers equipment and functions. Students learn how to write papers, letters, and memos using the QUILL word processing system in the latter three-hour workshop/lecture.

Noncredit courses offered by three other campus organizations complement ACC's offerings. The Locke Computer Center, serving the School of Medicine and the health sciences complex, provides courses on its own computer, word processing, and data analysis and management. Social science students, faculty, and staff members review word processing and various graphics and statistical analysis programs appropriate to their disciplines at the Center for Social Science Computation and Research. Continuing Education courses address concerns of people on campus and in the Seattle area. Spring 1983 courses include Systems Analysis and Design; Introduction to Programming Using BASIC; Computer Literacy: A Crash Course for the Uninitiated; and Chips, Bits, and Kids: A Parent's Guide to Computers.

Although the four organizations have begun to coordinate their efforts, Sobolewski would like to see greater attention to university-wide strategic planning in computers. He advises colleagues at other colleges and universities to study potential needs rather than simply react to current problems.

Sobolewski anticipates that the noncredit programming courses offered at ACC for the first time during spring 1983 will become the remedial courses of the future. He bases his prediction on the engineering and computer science instructors' interest in upgrading their programming courses to problem-solving in their fields using Pascal and FORTRAN, respectively. They believe that students pursuing engineering and computer science degrees will have learned these programming languages in high school or previous college courses. Although Sobolewski agrees that students in these specific programs may be familiar with computers, he sees a need for noncredit service courses in programming for other undergraduates. "We can provide a new service to students who need these computing tools to function in the age of information's workforce," he says. *P.B.*

For more information, contact: John S. Sobolewski, Director, Academic Computing Center, University of Washington, Seattle, WA 98105. 206/543-5970.

Western New England College

Engineering and Computers – Faculty members at Western New England College's School of Engineering have begun incorporating computer-based instruction in their courses, as they look for ways to best present various concepts to their students and maintain the integrity of teaching in the face of increasing class size, says Alan Karplus, assistant professor of engineering. The change is also in response to the students' growing interest in computers, Karplus adds.

In 1982 Karplus and a colleague designed computer-assisted tutorials for a freshman Engineering Graphics course that allow students to test what they have learned from their reading or class participation. Some of the course topics covered in the tutorials include lettering-geometry tools, multiview orthographics, pictorials, threads-fasteners, and intersections-developments. Exercises are multiple choice; true, false, don't know; and fill-in-the-blank, which include words and phrases to write in. Students may choose their own topics and level of difficulty and no students work on the same set of exercises because the problems are selected by a random number generator. Professors can prepare different but equal examinations for each student from the tutorial's data base.

The tutorials' advantages are that students receive immediate feedback, can pace themselves, and can go over one lesson or exercise as often as they want, Karplus says. He hopes the tutorial will help students improve their learning skills, become more familiar with the concepts presented in the course, reduce test anxiety, and expand what the teacher can cover in the classroom. Karplus has not yet been able to formally assess the program's benefits, but he suspects the poorer students take less advantage of the program and therefore are benefitting less from the tutorials.

In 1982 Introduction to Engineering Design students used computer graphics and programming in their projects to develop devices that increase the mobility of disabled limbs. Several groups included computer graphics of limbs in their final reports and others used computer programs to compute the best size and strength of the gripper devices. In the 1983 project students may choose to use computers to analyze design problems and develop solutions that conserve time, materials and energy.

To introduce students to microprocessing and computer language in one to three weeks, Karplus and a colleague developed a simplified Sample Assemble Language (SAL) and wrote a BASIC program for the school's Data General MV/8000 small mainframe computer that simulates assembly and execution of SAL programs, Karplus says. SAL contains 17 programming instructions, including simple arithmetic operations, data han-

dling operations of storing into memory and loading registers, and printing, among others. Students in the freshmen Engineering Design course and a junior and senior level mechanical engineering laboratory are using SAL. The response from students using SAL has been very positive, says Karplus.

All freshmen engineering students are required to take Introduction to Computer Programming, which covers how to use the computer system and FORTRAN and prepares students to use computers in their other courses. To help students overcome their computer anxiety in any course, Karplus says students must learn "that if you aren't successful the first time you can be successful on the third or fourth try." The role of the teacher, Karplus believes, is "to be sure these students are willing to try until they are successful." *T.A.*

For more information, contact Alan Karplus, Assistant Professor, School of Engineering, Western New England College, 1215 Wilbraham Road, Springfield, MA 01119. 413/782-3111.

Resources

American Association for Higher Education (AAHE), Center for Learning and Telecommunications, One Dupont Circle, Suite 600, Washington, D.C. 20036. Marilyn Kressel, Director.

Established in 1980 with a Carnegie Corporation grant, the center's mission is to inform college and university educators about options available through telecommunications for teaching. Their 1980 directory by Raymond Lewis, *Meeting Learners' Needs Through Telecommunications: A Directory and Guide to Programs*, describes 70 educational projects using video, audio, and computer technologies and summarizes current trends in the use of technology in higher education. Lewis, research director for the center, warns educators to stay informed on the issues of equity for learners, quality in courseware, and the role of educators in the development of new educational technologies. The center also publishes *TELESCAN*, a bimonthly digest that monitors developments in the use of telecommunications for adult education. Subscribers to *TELESCAN* or purchasers of the directory may utilize the center's computer based inquiry service for free during its pilot phase from January to June 1983. The service will cross reference the two publications.

American Association for Higher Education. *Bulletin #3*. Washington, D.C.: AAHE, November 1982.

In this issue, articles focus on the impact of computers and telecommunications in higher education. Francis Fisher argues that computers are a valid tool for educators and "the locus for scholarship." The benefits of the computer, Fisher says, include individual instruction on esoteric topics, increased productivity, and improved scholarship. He also argues that as businesses take on more responsibilities for educating their employees, computers become increasingly important to keep colleges competitive. In an interview, vice president of the Sloan Foundation, James Koerner, discusses the Sloan Foundation's program to encourage liberal arts educators to focus on technology, quantitative reasoning, and applied mathematics. Fred Davidson shares his view as president of University of Georgia on the importance and impact of technology on universities. Students now need courses in problems solving and computers should be the course's tools, Davidson argues. Computers will also enhance faculty development and student-teacher interaction, he says.

American Society for Engineering Education. *Engineering Education #5*, Washington, D.C.: ASAE, February, 1983.

This issue, titled "Effective Teaching and New Technology," is devoted to computer-based engineering instruction. Articles discuss Western New England College's computer-assisted tutorials; how engineering courses must be redesigned to keep in step with technological advances; how to use the word processor to teach large writing classes; and how an introductory computer programming course uses computers as teaching aides.

Bailey, Robert. *Information Systems and Technological Decisions: A Guide for Non-Technical Administrators*. AAHE-ERIC/Higher Education Research Report No. 8, 1982. Washington, D.C.: American Association for Higher Education, 1982.

Bailey is addressing college administrators in this report and tells now to best make decisions about computers. He advises taking into consideration that the technology is still evolving; purchasing a system that has been first tested on other campuses; and determining exactly what the computer will be used for before it is purchased. The final decision, Bailey continues, must be made by the people who will use the system and should not be left up to the systems specialist. He also describes trends affecting information systems, including enrollment; the evolution and status of computer systems, hardware and software options; and the benefits of the technology for administrative offices.

Bork, Alfred. *Learning with Computers*. Massachusetts: Digital Equipment Corporation, 1981.

This book begins with an overview of the present and future use of the computer as an educational tool and discusses whether computers will replace the teacher. Bork then examines the specifics of academic computing, including computer graphics, APL as a language for interactive computer graphics, computer dialogues for student use with graphics and quizzes, and computer science instruction. Issues in academic computing that will become more relevant in the future that Bork discusses are the transferability of computer-based learning materials, personal computers, intelligent videodiscs, and extending the university campus with computers. The book is based on the work of the Physics Computer Development Project and the Educational Technology Center at Irvine, California and Bork addresses their activities.

Brown, Peggy, ed. *The Forum for Liberal Education*, Washington, D.C.: Association of American Colleges, May 1981.

This issue of *Forum* focuses on computer-based learning and begins with three essays examining the role of computers in liberal education, in the humanities and social sciences, and in the natural sciences. Featured universities and colleges include Grinnell College, California State College at Bakersfield, Northern Kentucky University, and the University of Delaware. All entries in the resources section differ from this issue. Individual copies are available for $2 from the *Forum* office.

Caldwell, Robert. "Computers and Curriculum—Promises and Problems." *Technology and Education: Policy, Implementations, Evaluation*. Proceedings of the National Conference on Technology and Education, January 1981.

Caldwell cites numerous benefits of computer-based instruction including extending the university campus; individualizing instruction; and easily providing drill and practice exercises, including instruction that uses different senses. The costs of computers are down and computers may lower attrition by increasing students' interest in learning, Caldwell says. But standing in the way of computer-based instruction is the lack of adequate courseware, poor computer skills, and the myth that computer-based instruction is dehumanizing and will replace the teacher.

CAUSE, 737 Twenty Ninth Street, Boulder, CO. 303/449-4430. Charles Thomas, Executive Director.

CAUSE is a membership organization for professionals engaged in the development, use, and management of administrative and academic informations systems. Its 400 members are primarily computer center directors and administrators. Six times a year members receive the publication *CAUSE/EFFECT*, edited by Julia Rudy, which covers topics such as successful computing strategies at colleges, how an electronic delivery system can improve a college's financial aid program, and how to use information systems to counter budget cuts. Also available to members is a monograph series, which includes *Legal Protection for Computer Programs; Administration Information Systems: A 1980 Profile*; and *Computers in Higher Education: A Planning*

Prospective for Administrators. The organization will soon have a national data base on computer systems accessible to members by telephone. Membership dues are on a sliding scale.

"Computers: The 'Wired University' Is On the Way." *Business Week* 2736 (April 26, 1982): 68-73.

This article presents an overview of students and faculty members' use of computers, the research done on students' use of computers, how college campuses are connecting with computers, and the future of academic computing.

Gillespie, Robert. *Computers and Higher Education: An Accidental Revolution*. Washington, D.C.: National Science Foundation, 1982.

The report is based on a National Science Foundation (NSF) study made by a panel of educators on computing in higher education. It covers a wide variety of topics and issues, in particular how "to integrate the traditional goals of higher education into the new 'information marketplace' and how to link the interests of education, industry, and government in efforts to improve national productivity." The panel recommends that the NSF establish a commission to develop cooperative programs between industry, education and government to support higher education computing. Other topics covered in the report include the development of academic computing, its effect on higher education, and the limits of growth of computers in higher education.

Gwaltney, Corbin, ed. *The Chronicle for Higher Education*. Washington, D.C., March 30, 1983.

This issue includes a number of articles on computers in higher education. The lead article, "Colleges Struggling to Cope with the Computer Age," discusses the belief that "only a relatively few campuses are successfully adapting to the latest technological developments" and analyzes what is being done to bring colleges into the computer age. In a side bar, the author reports on the findings of a survey of how faculty members use microcomputers. Topics of other articles include Carnegie-Mellon's computer program, the shortage of 'super computers' at universities in the United States, and the salaries of computer science faculty members. The issue also has a resource section and an opinion piece arguing that the long term effects of computers on education "could be catastrophic."

Magarrell, Jack, "Microcomputers Proliferate on College Campus." *The Chronicle for Higher Education* 6 (April 6, 1983): 9.

Educators at a recent computer conference give their impressions and ideas on computers in higher education in this article. They predict that in twenty years computers will replace books for bringing information to students. They also warn that unequal access to computers in elementary schools for black students means less blacks in science and mathematics; development of courseware is vital but has been held back by high costs and "concern over illegal copying of the electronic material;" and with the development of computers for research, scholars may at first lose some of their autonomy. The article also includes a side bar with information on an institute that trains non-computer professors to teach computer science; computerized fund raising, and more.

Masat, Francis. *Computer Literacy in Higher Education*. AAHE-ERIC/Higher Education Research Report No. 6, 1981. Washington, D.C.: American Association for Higher Education, 1981.

This monograph begins with a discussion of the different definitions and opinions of computer literacy. Masat says that computer literacy is a requirement not yet being met by many higher education institutions, but the increase of computers in elementary and secondary schools may result in computer literacy becoming a basic requirement for colleges. He discusses the problems and politics of beginning computer literacy programs on the institutional and national level. In the final chapter he assesses existing computer literacy practices and research and concludes that although "computers are benign, those who control them may not be. Thus. . . computer literacy will become increasingly necessary for effective participation in a free society."

Poole, Lawrence, et al. "Computer Literacy: The New Mandate for General Education in the 1980s." Saranac Lake, New York: North Country Community College, 1982.

Poole argues in support of computer-based instruction, citing the computer's editorial capacities, use in vocabulary and grammar development, and benefit to disabled students. Poole discusses in detail specific uses of the computer in social science research and instruction, data analysis software, simulations and word processing. North Country Community College's own use of computers is described as an example of computers' benefits for higher education.

Public Broadcasting Service, The Computer Programme Series, Washington, D.C.: (PBS), April 1983.

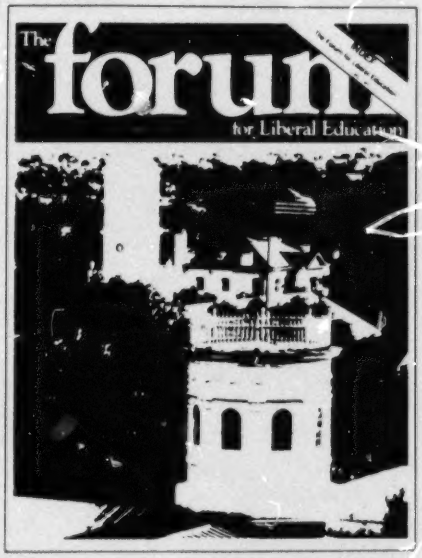
The ten-part BBC produced television series, which has already met with good reviews in England, uses demonstrations, commentary by experts, and simulations to introduce computers to the layperson. Each weekly half hour show addresses a different topic and includes a hands-on demonstration by a novice. The programs include, among others, the development of computers, the mathematical concepts behind computer programming, the information storage capacity of computers, computer games and simulation, and the impact of computers on society. The programs will also discuss computer careers.

Stoan, Stephen. "Computer Searching: A Primer for the Uninformed Scholar." *Academe* 6 (November/December 1982): 10-15.

Stoan gives the scholar a consumer report on computer library searches, explaining how to use them, warning of their pitfalls, and highlighting their advantages. Files available for computer searches vary from bibliographies to factual and statistical packages. Computer searches can yield more recent citations than print indexes, can retrieve citations according to many criteria, and can easily look for a variety of descriptors. Stoan argues that the computer search should not replace the manual search of printed materials; manual searches teach students a lot about their subject and allow scholars to do their research free of assistance and at no cost.

Resources prepared by Tina Adler.

Note to Readers



This issue of *Forum* concludes volume five. Topics covered during the 1982–83 year included Science Literacy for All Students (October 1982), Extending General Education to the Junior and Senior Years (November/December 1982), Educational Equity for Minorities (January/February 1983), Peace Studies (March 1983), and Cooperative Activities Between High Schools and Colleges (April 1983). Additional copies of these issues are available from the *Forum* office for $2 each. Subscribers will receive an index to volume five in late June. You may also purchase extra copies of the index for $1.

Included with subscription copies of this issue are evaluation forms for volume five. Please help the staff select the issue topics that will help you address some of the critical concerns on your campus. Fill out the enclosed form and return to the *Forum* office at AAC by June 15, 1983. In addition, we welcome news of your activities and publications for possible inclusion in future issues.

aac

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The Forum for Liberal Education is a topic-oriented publication featuring a subject of importance for liberal education in each issue. It does not endorse or evaluate institutitutional activity. Rather, it describes various ways in which institutions of higher learning address important common concerns. Upcoming issues of the *Forum* will look at honors programs and AAC Project Lodestar activities. **The Forum staff is interested in receiving program information from our readers.** If your school is chosen for inclusion in an issue a staff member will interview a contact person at your school and write the article.

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